U.S. DEPARTMENT OF COMMERCE
National Technical Information Service

PB-269 470

Black Lake, Natchitoches and Red River Parishes Louisiana

National Eutrophication Survey, Las Vegas, Nev

Prepared for

Environmental Monitoring and Support Lab, Las Vegas, Nev

Mar 77

PB 269 470

U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL EUTROPHICATION SURVEY
WORKING PAPER SERIES

CORVALLIS ENVIRONMENTAL RESEARCH LABORATORY - CORVALLIS, OREGON
and
ENVIRONMENTAL MONITORING & SUPPORT LABORATORY - LAS VEGAS, NEVADA

REPRODUCED BY
NATIONAL TECHNICAL
INFORMATION SERVICE
U.S. DEPARTMENT OF COMMERCE
SPRINGFIELD, VA. 22161

TECHNICAL REPORT DATA

(Please read Instructions on the reverse before completing)

1. REPORT NO.	2. RECIPIENT'S ACCESSION NO. PB 267170
4. TITLE AND SUBTITLE: Report on Black Lake, Natchitoches and Red River Parishes, Louisiana	5. REPORT DATE: Prepared March 1977
7. AUTHOR(S): Anonymous (National Eutrophication Survey Staff)	8. PERFORMING ORGANIZATION REPORT NO.: Working Paper No. 531
9. PERFORMING ORGANIZATION NAME AND ADDRESS: National Eutrophication Survey U.S. Environmental Protection Agency P.O. Box 15027 Las Vegas, NV 89114	10. PROGRAM ELEMENT NO. 11. CONTRACT/GRANT NO.
12. SPONSORING AGENCY NAME AND ADDRESS: Office of Research and Development U.S. Environmental Protection Agency 401 M Street, S. W. Washington, DC 20460	13. TYPE OF REPORT AND PERIOD COVERED: Final - 1974 14. SPONSORING AGENCY CODE

15. SUPPLEMENTARY NOTES: Prepared in cooperation with the U.S. Environmental Protection Agency, Corvallis Environmental Research Laboratory, Eutrophication Survey Branch, Corvallis, OR 97330

16. ABSTRACT

Annual total phosphorus and total nitrogen loadings to the lake were estimated and subdivided according to either point or non-point source origin. An assessment of the lake's trophic condition and limiting nutrient is also provided. All data collected by the U.S.E.P.A. National Eutrophication Survey during the one year study of the lake and its tributaries are included in the report.

17. KEY WORDS AND DOCUMENT ANALYSIS

a. DESCRIPTORS	b. IDENTIFIERS/OPEN ENDED TERMS	c. COSATI Field/Group
eutrophication lakes nutrients phosphorus nitrogen loading		05B 05C

18. DISTRIBUTION STATEMENT: Release unlimited	19. SECURITY CLASS (This Report)	21. NO. OF PAGES: 25
	20. SECURITY CLASS (This page)	22. PRICE: PB 267-170

EPA Form 2220-1 (9-73)

REPORT

ON

BLACK LAKE

NATCHITOCHES AND RED RIVER PARISHES

LOUISIANA

EPA REGION VI

WORKING PAPER No. 531

WITH THE COOPERATION OF THE

LOUISIANA WILD LIFE AND FISHERIES COMMISSION

AND THE

LOUISIANA NATIONAL GUARD

MARCH, 1977

REPORT ON BLACK LAKE

NATCHITOCHES AND RED RIVER PARISHES, LOUISIANA

EPA REGION VI

by

National Eutrophication Survey

Water and Land Monitoring Branch
Monitoring Applications Laboratory
Environmental Monitoring & Support Laboratory
Las Vegas, Nevada

and

Eutrophication Survey Branch
Corvallis Environmental Research Laboratory
Corvallis, Oregon

Working Paper No. 531

OFFICE OF RESEARCH AND DEVELOPMENT
U.S. ENVIRONMENTAL PROTECTION AGENCY

March, 1977

CONTENTS

	Page
Foreword	ii
List of Louisiana Study Lakes	iv
Lake and Drainage Area Map	v
Sections	
I. Introduction	1
II. Conclusions	2
III. Lake Characteristics	3
IV. Lake Water Quality Summary	4
V. Literature Reviewed	8
VI. Appendices	9

FOREWORD

The National Eutrophication Survey was initiated in 1972 in response to an Administration commitment to investigate the nationwide threat of accelerated eutrophication to freshwater lakes and reservoirs.

OBJECTIVES

The Survey was designed to develop, in conjunction with state environmental agencies, information on nutrient sources, concentrations, and impact on selected freshwater lakes as a basis for formulating comprehensive and coordinated national, regional, and state management practices relating to point source discharge reduction and nonpoint source pollution abatement in lake watersheds.

ANALYTIC APPROACH

The mathematical and statistical procedures selected for the Survey's eutrophication analysis are based on related concepts that:

a. A generalized representation or model relating sources, concentrations, and impacts can be constructed.

b. By applying measurements of relevant parameters associated with lake degradation, the generalized model can be transformed into an operational representation of a lake, its drainage basin, and related nutrients.

c. With such a transformation, an assessment of the potential for eutrophication control can be made.

LAKE ANALYSIS

In this report, the first stage of evaluation of lake and watershed data collected from the study lake and its drainage basin is documented. The report is formatted to provide state environmental agencies with specific information for basin planning [§303(e)], water quality criteria/standards review [§303(c)], clean lakes [§314(a,b)], and water quality monitoring [§106 and §305(b)] activities mandated by the Federal Water Pollution Control Act Amendments of 1972.

Beyond the single lake analysis, broader based correlations between nutrient concentrations (and loading) and trophic condition are being made to advance the rationale and data base for refinement of nutrient water quality criteria for the Nation's freshwater lakes. Likewise, multivariate evaluations for the relationships between land use, nutrient export, and trophic condition, by lake class or use, are being developed to assist in the formulation of planning guidelines and policies by the U.S. Environmental Protection Agency and to augment plans implementation by the states.

ACKNOWLEDGMENTS

The staff of the National Eutrophication Survey (Office of Research and Development, U.S. Environmental Protection Agency) expresses sincere appreciation to the Louisiana Wild Life and Fisheries Commission, Division of Water Pollution Control for professional involvement, to the Louisiana National Guard for conducting the tributary sampling phase of the Survey, and to those Louisiana wastewater treatment plant operators who provided effluent samples and flow data.

Robert A. Lafleur, Chief; J. Dale Givens, Assistant Chief; Lewis P. Still, Biologist; Louis Johnson, Biologist; Lee Caubarreaux, Biologist; Darrell Reed, Engineer; Dempsey Alford, Biologist; and Elwood Goodwin, Water Quality Control Technician, all of the Louisiana Wild Life and Fisheries Commission, Division of Water Pollution Control reviewed the preliminary reports and provided critiques most useful in the preparation of this Working Paper Series.

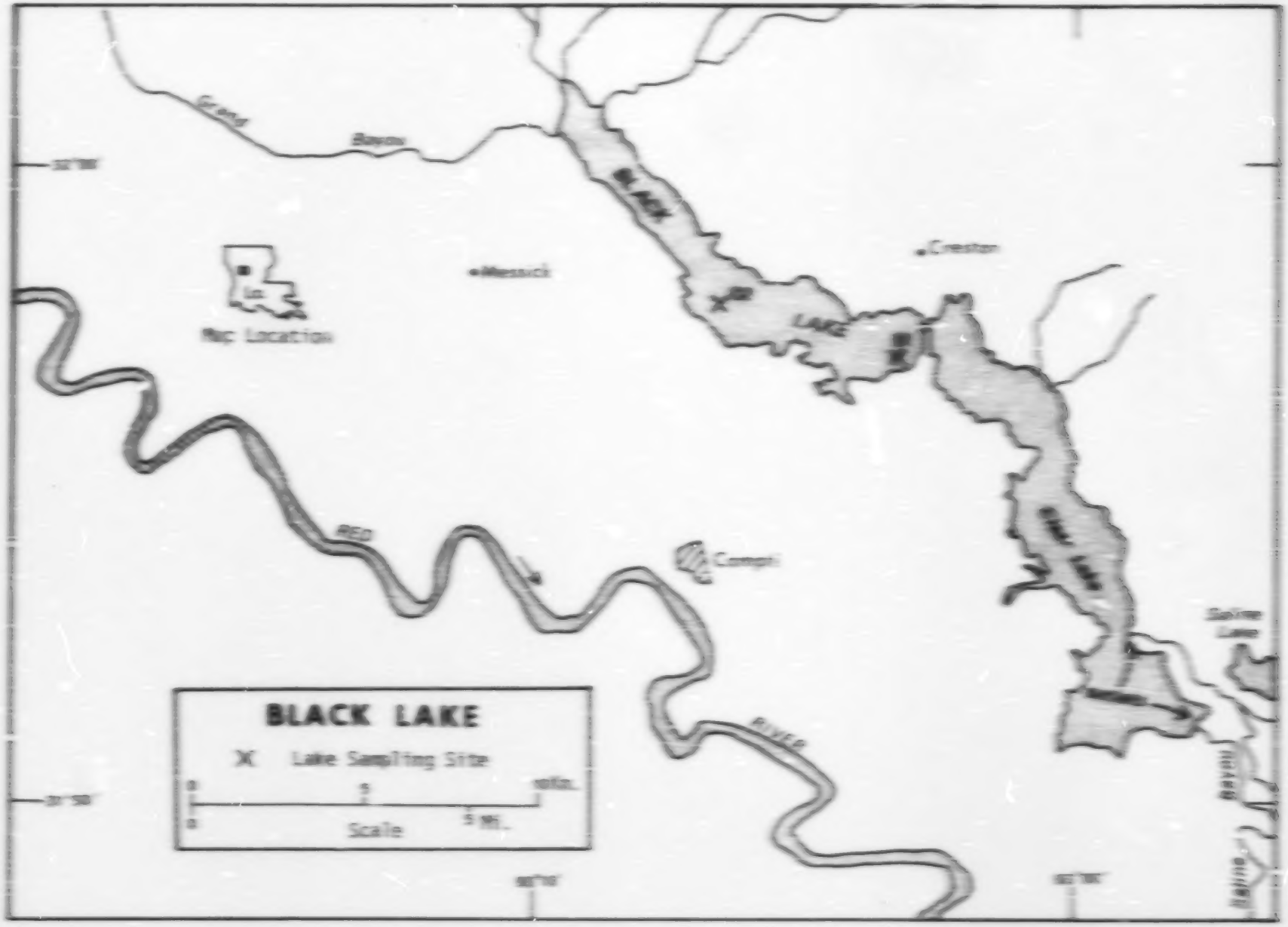
Major General O'Neil Daigle, Jr., the Adjutant General of Louisiana, and Project Officer Colonel Lawrence P. Dupre, who directed the volunteer efforts of the Louisiana National Guardsmen, are also gratefully acknowledged for their assistance to the Survey.

NATIONAL EUTROPHICATION SURVEY

STUDY LAKES

STATE OF OKLAHOMA

LAKE NAME	PARISH
Anacoco Lake	Vernon
Lake Bistineau	Bienville, Webster
Black Bayou	Caddo
Black Lake	Natchitoches and Red River
Bruin Lake	Tensas
Bundicks Lake	Beauregard
Caddo Lake	Caddo (Marion and Harrison in Texas)
Cocodrie Lake	Concordia
Cocodrie Lake (Lower)	Rapides
Concordia Lake	Concordia
Cottle Lake	Rapides
Cross Lake	Caddo
D'Arbonne Lake	Union
False River Lake	Pointe Coupee
Indian Creek Reservoir	Rapides
Saline Lake	LaSalle
Turkey Creek Lake	Franklin
Lake Vernon	Vernon
Lake Verret	Assumption


Grand
Bayou
BLACK
LAKE
Natchitoches
Crestor
LAKE
Rapides
Location
RED
Campti
RIVER
BLACK LAKE
X Lake Sampling Site
0
5
Miles
0
5 Mi.
Scale

REPORT ON BLACK LAKE, LOUISIANA

\FORET NO. 2219

I. INTRODUCTION

Black Lake was included in the National Eutrophication Survey (NES) as a water body of interest to the Louisiana Stream Control Commission and Louisiana Wild Life and Fisheries Commission. Tributaries and nutrient sources were not sampled, and this report relates only to the data obtained from lake sampling.

Black Lake is a reservoir located in Natchitoches and Red River Parishes in Northwestern Louisiana. Most of the area known as Black Lake is thick with vegetation, while much of the adjacent area known as Clear Lake is open water. The lakes, which have been designated the Northwest Game and Fish Preserve, are used heavily for recreation, and there exist numerous camps in the south shore of Clear Lake. The remainder of the Black-Clear shoreline is sparsely developed (Shampine, 1971).

Runoff from logging operations, salt water and septic tank contributions from shoreline campgrounds are the major causes of water quality deterioration in Black Lake. In addition, future strip mining for lignite may result in further lake degradation (Leslie Johnson, personal communication).

II. CONCLUSIONS

A. Trophic Condition:*

Survey data indicate that Black Lake is eutrophic, i.e., nutrient rich and highly productive. Whether such nutrient enrichment is to be considered beneficial or deleterious is determined by its actual or potential impact upon designated beneficial water uses of each lake.

Chlorophyll *a* levels ranged from 8.2 µg/l to 19.1 µg/l with a mean of 12.7 µg/l. Of the 19 Louisiana water bodies sampled in 1974, 7 had greater median total phosphorus, 7 had greater median orthophosphorus, 4 had greater median inorganic nitrogen, and 12 had lower mean Secchi disc transparency than Black Lake.

Survey limnologists did not report any nuisance conditions in the lake. However, the Louisiana Wild Life and Fisheries Commission (Leslie Johnson, personal communication) reports that Black Lake has had chronic submerged weed problems which were temporarily suppressed at the time of sampling by a water draw down program completed a short time before.

B. Rate-Limiting Nutrient:

No algal assay samples were collected at Black Lake. However, the lake data suggest phosphorus limitation during the May sampling round and nitrogen limitation in August.

*See Appendix C.

III. LAKE CHARACTERISTICS

A. Lake Morphometry:*

A. Surface area: 52.04 km^2.
B. Mean depth: 2.6 meters.
C. Maximum depth: 4.6 meters.
D. Volume: 134,460 x 106 m^3.

B. Precipitation:

A. Year of sampling: 179.9 cm.
B. Mean annual: 158.1 cm.

*Provided by the State of Louisiana.

IV. LAKE WATER QUALITY SUMMARY

Black Lake was sampled two times during the open-water season of 1974 by means of a pontoon-equipped Huey helicopter. Each time, samples for physical and chemical parameters were collected from two stations on the lake and from one or more depths at each station (see map, page v). During each visit, depth-integrated samples were collected from each station for chlorophyll *a* analysis and phytoplankton identification and enumeration. Maximum depths sampled were 1.5 meters at Station 01 and 0.6 meters at Station 02. For a more detailed explanation of NES methods, see NES Working Paper No. 175.

The results obtained are presented in full in Appendix B and are summarized in IV-A for waters at the surface and at the maximum depth for each site. Results of the phytoplankton counts and chlorophyll *a* determinations are included in IV-B. Results of the limiting nutrient study are presented in IV-C.

B. Biological Characteristics:

1. Phytoplankton -

Sampling Date	Dominant Genera		Algal Units per ml
05/30/74	1.	Stephanodiscus	1,199
	2.	Kirchneriella	1,133
	3.	Aphanizomenon	1,065
	4.	Blue-green filament	799
	5.	Cryptomonas	666
		Other genera	5,131
		Total	9,994
08/23/74	1.	Lyngbya	9,900
	2.	Dactylococcopsis	2,903
	3.	Anabaenopsis	1,340
	4.	Achanothece	670
	5.	Spermatozoopsis	670
		Other genera	3,420
		Total	18,903

2. Chlorophyll a

Sampling Date	Station Number	Chlorophyll a (ug/liter)
05/30/74	01	19.1
	02	8.2
08/23/74	01	10.9
	02	--

C. Limiting Nutrient Study:

Black Lake was not sampled in either March or November 1974. Consequently, no algal assay sample for this lake was obtained. However, the lake data indicate that Black Lake was phosphorus limited in May; i.e., the mean inorganic nitrogen to orthophosphorus (N/P) ratio was 16/1. Nitrogen limitation was indicated in August (the mean N/P ratio was less than 2/1, and nitrogen limitation would be expected). The overwhelming dominance of the algal flora by blue-green forms in August substantiates nitrogen limitation at that time.

V. LITERATURE REVIEWED

Johnson, Leslie. 1977. Personal Communication. (water quality of Black Lake). Louisiana Wild Life and Fisheries Commission. New Orleans, Louisiana.

Champine, W.J. 1971. Chemical Biological and Physical Data for the Major Lakes and Reservoirs in Louisiana. Louisiana Dept. of Public Works, Report #5. Baton Rouge, La.

U.S. Environmental Protection Agency 1978. National Eutrophication Survey Methods 1973-1976. Working Paper No. 175. Environmental Monitoring and Support Laboratory, Las Vegas, Nevada and Corvallis Environmental Research Laboratory, Corvallis, Oregon.

VI. APPENDICES

APPENDIX A
CONVERSION FACTORS

CONVERSION FACTORS

Hectares x 2.471 = acres

Kilometers x 0.6214 = miles

Meters x 3.281 = feet

Cubic meters x 8.107×10^{-4} = acre/feet

Square kilometers x 0.3861 = square miles

Cubic meters/sec x 35.315 = cubic feet/sec

Centimeters x 0.3937 = inches

Kilograms x 2.205 = pounds

Kilograms/square kilometer x 5.711 = lbs/square mile

APPENDIX B
PHYSICAL AND CHEMICAL DATA

[illegible]

APPENDIX C

PARAMETRIC RANKINGS OF LAKES SAMPLED BY NES IN 1974

STATE OF LOUISIANA